U.S. FISH AND WILDLIFE SERVICE SPECIES ASSESSMENT AND LISTING PRIORITY ASSIGNMENT FORM

Scientific Name:

Cicindela highlandensis

Common Name:

Highlands tiger beetle

Lead region:

Region 4 (Southeast Region)

Information current as of:

03/29/2012

Status/Action

___ Funding provided for a proposed rule. Assessment not updated.

___ Species Assessment - determined species did not meet the definition of the endangered or threatened under the Act and, therefore, was not elevated to the Candidate status.

___ New Candidate

_X_ Continuing Candidate

___ Candidate Removal

> ___ Taxon is more abundant or widespread than previously believed or not subject to the degree of threats sufficient to warrant issuance of a proposed listing or continuance of candidate status
>
> ___ Taxon not subject to the degree of threats sufficient to warrant issuance of a proposed listing or continuance of candidate status due, in part or totally, to conservation efforts that remove or reduce the threats to the species
>
> ___ Range is no longer a U.S. territory
>
> ___ Insufficient information exists on biological vulnerability and threats to support listing
>
> ___ Taxon mistakenly included in past notice of review
>
> ___ Taxon does not meet the definition of "species"
>
> ___ Taxon believed to be extinct
>
> ___ Conservation efforts have removed or reduced threats

___ More abundant than believed, diminished threats, or threats eliminated.

Petition Information

___ Non-Petitioned

_X_ Petitioned - Date petition received: 05/11/2004

90-Day Positive:05/11/2005

12 Month Positive:05/11/2005

Did the Petition request a reclassification? **No**

For Petitioned Candidate species:

Is the listing warranted(if yes, see summary threats below) **Yes**

To Date, has publication of the proposal to list been precluded by other higher priority listing? **Yes**

Explanation of why precluded:

Higher priority listing actions, including court-approved settlements, court-ordered and statutory deadlines for petition findings and listing determinations, emergency listing determinations, and responses to litigation, continue to preclude the proposed and final listing rules for this species. We continue to monitor populations and will change its status or implement an emergency listing if necessary. The Progress on Revising the Lists section of the current CNOR (http://endangered.fws.gov/) provides information on listing actions taken during the last 12 months.

Historical States/Territories/Countries of Occurrence:

- **States/US Territories**: Florida
- **US Counties**: Highlands, FL
- **Countries**:Country information not available

Current States/Counties/Territories/Countries of Occurrence:

- **States/US Territories**: Florida
- **US Counties**: Highlands, FL, Polk, FL
- **Countries**:Country information not available

Land Ownership:

The Highlands tiger beetle has been documented at 40 sites in public or private ownership (Knisley 2005, pp. 5-6). The largest counts (> 40 individuals) were found at the following locations (Knisley 2005, p. 6):

- Allen David Broussard Catfish Creek State Park Preserve, owned and managed by Florida Department of Environmental Protection (FDEP)
- Snell Creek, part of the Lake Wales Ridge National Wildlife Refuge (NWR) and property of the U.S. Fish and Wildlife Service (Service)

- Flaming Arrow Boy Scout Ranch, privately owned
- Tiger Creek Preserve, owned by The Nature Conservancy (TNC)
- Carter Creek A, part of Lake Wales Ridge NWR
- Flamingo Villas, part of Lake Wales Ridge NWR
- Horse Creek Scrub, > 50 percent in conservation ownership
- Walk-in-the-Water Tract, part of Lake Wales Ridge State Forest, owned and managed by the Florida Division of Forestry (FDOF)

The beetle also occurs on the following managed areas (D. Almquist, Florida Natural Areas Inventory [FNAI], pers. comm. 2009):

- Hatchineha Ranch, owned by TNC
- Lake Wales Ridge Wildlife and Environmental Area, owned by the Florida Fish and Wildlife Conservation Commission (FWC)
- Sherwood L. Stokes Preserve / Lake Marion, owned by Polk County Environmental Services Department
- Upper Lake Marion Creek Watershed, owned by the Southwest Florida Water Management District
- Upper Lakes Basin Watershed, owned by the South Florida Water Management District (SFWMD).

It is difficult to determine the total amount of occupied habitat on public and private land. Many sites are less than 1 hectare (ha) (2.47 acres) in size (NatureServe 2009, pp. 1-2). The number of sites is not equivalent to the number of populations (see Population Estimates). Several sites are small and in close proximity to each other.

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Biological Information

Species Description:

The Highlands tiger beetle (Cicindela highlandensis) is a member of the beetle family Cicindelidae (tiger beetles), which includes more than 2,000 species worldwide, more than 100 in the United States (Pearson and Cassola 1992, pp. 379, 381), and about 25 in Florida (Knisley and Hill 1992a, p.5). Adult tiger beetles are medium-sized, elongate beetles, mostly with brilliant metallic green, blue, red, and yellow coloration highlighted by stripes and spots. The Highlands tiger beetle is an exception, being mostly black. The Highlands tiger beetle is 10.5-12.0 millimeters long (0.4-0.5 inches) (Deyrup 1994, p. 364). Adult tiger beetles are ferocious, swift, and agile predators that seize small prey with powerful sickle-shaped jaws (Essig 1942, p. 530; Nagano 1982, p. 34; Pearson 1988, pp. 124, 126-127, 132). In Florida, their prey is typically ants (Choate 1996, p. 2).

Tiger beetle larvae are also predatory. They live in singular, small burrows from which they lunge and seize passing invertebrate prey (Essig 1926, p. 372; Essig 1942, p. 532; Pearson 1988, pp. 131-132). When a prey item passes near a burrow, the larva grasps it with its strong mandibles (mouthparts), pulls it into the burrow, and feeds (Essig 1942, p. 531-532; Pearson 1988, p. 132). Tiger beetles share similar larval body forms throughout the world (Pearson and Cassola 1992, p. 377). The larvae, either white, yellowish, or dusky in

coloration, are grub-like and fossorial (subterranean), with a hook-like appendage on the fifth abdominal segment that anchors the larvae inside their burrows.

Tiger beetle larvae undergo three instars (larval development stages). This period can take 1 to 4 years, with a 2-year period being the most common (Pearson 1988, p. 129). The Highlands tiger beetle generally has a 1-year life cycle (Knisley and Hill 1996, pp. 2, 16-17, 20). Adults begin to emerge from mid- to late-May, reaching peak abundance about mid-June, then declining in numbers from mid-July onward. Only a few adults survive into late August and early September. Adults mate and begin oviposition (egg-laying) within about two weeks of emergence. First-instar larvae begin to appear in late June and reach peak abundance from late July to early August. Survivors develop to the second instar within 2 to 4 weeks. Second instars, which are at peak abundance from late August to October, require about 4 to 8 weeks to develop to the third instar. Third instars can be found from August through the following spring. This stage requires more food and lasts several months, at a minimum. Many third instars may nearly complete their development by December or January, but will open their burrows for an occasional feeding until they pupate later in spring (Knisley and Hill 1996, p. 17). Pupation occurs in April or early May, although some larvae of a cohort (probably less than 15 percent) will lag in their development and emerge after 2 years of development (Knisley and Hill 1996, p. 17).

Survivorship of Highlands tiger beetle larvae from first instar through the third instar ranged from about 11 to 22 percent at the three sites that Knisley and Hill (1996, p. 17) studied for 2 years. The highest mortality occurred in larvae during their first few months, August to October. Predation by ants that took over the burrows was largely restricted to first instars. Parasitism from bee flies (Anthrax) was a significant mortality factor for third instar larvae; most samples of larvae had parasitism rates over 15 percent, a rate similar to those found for other species of tiger beetle (Knisley 1987, pp. 1192-1198; Knisley and Hill 1996, p. 18). Knisley and Hill also saw a small parasitic wasp, apparently Methocha. Robber flies (family Asilidae) were common at all of the study sites and appear to be the major predators of adults. During 110 hours of field observation, 22 predation attempts on adults by robber flies resulted in 5 successful attacks (Knisley and Hall 1996, p. 19).

A large body of scientific literature is devoted to tiger beetles, and a tiger beetle scientific journal, Cicindela, has been published since 1969. Tiger beetle species occur in many different habitats (Pearson 1988, pp. 135-136, 139; Knisley and Hill 1992a, p. 4). A common habitat component appears to be open, sunny areas used for hunting and thermoregulation (adaptive behavior to use sunlight or shade to regulate body temperature) (Pearson 1988, p. 134; Knisley et al. 1990, pp. 911-915; Knisley and Hill 1992a, pp. 7-8).

Taxonomy:

Choate (1984, pp. 73-82) described the Highlands tiger beetle as a new species in a paper that also dealt with two similar species, C. scabrosa (the Florida scrub tiger beetle) and C. abdominalis. These three species constitute the “C. abdominalis group.” The three species are similar, very small and black (with green, blue, and purple reflections), with an orange abdomen visible from the underside. They can be distinguished by several prominent features. The elytrya (leathery forewings) of Cicindela abdominalis are shallowly punctured; Cicindela scabrosa deeply punctured, and Cicindela highlandensis glabrous (i.e., without the punctures). The Highlands tiger beetle also lacks conspicuous white flattened hairs on both sides of the thorax and the underside of the abdomen.

NatureServe (2010, p. 1) and the FNAI (2011, p. 16) use the name C. highlandensis. The Integrated Taxonomic Information System (2011, p. 1) also uses the name C. highlandensis and indicates that this species’ taxonomic standing is accepted. We have carefully reviewed the available taxonomic information to reach the conclusion that the species is a valid taxon.

Habitat/Life History:

The Highlands tiger beetle is often associated with evergreen scrub oaks, as well as high pineland with deciduous turkey oak (Quercus laevis) and longleaf pines (Pinus palustris). High quality habitat is primarily scrub or sandhill with a high percent of open sand (greater than 50 percent) and with many natural openings, which are continuous or connected to adjacent open patches or connected by lightly disturbed trails or paths (Knisley and Hill 1996, p. 9; D. Almquist, pers. comm. 2009). Adults were not found in areas of dense scrub (except along the edges of trails) nor in areas of low shrubs (Knisley and Hill 1996, pp. 11, 14-16, 21). This species was regularly found on trails with evidence of at least moderate off-road vehicle traffic and where there was evidence of past vegetation clearing or other ground disturbance (Knisley and Hill 1992a, p. 8; 1996, pp. 15, 20). This suggests that because of fire suppression, the vegetation has become artificially dense, harming the beetle. The need for prescribed burning of the vegetation or alternative methods of clearing openings, such as scraping, as Knisley and Hill (1996, pp. 16, 21-22) and Knisley (2005, p. 9) suggested, and other management measures are discussed below (see Threats).

Results from surveys conducted during 2004-2005 (Knisley 2005, pp. 7-8) supported previous conclusions that the Highlands tiger beetle occurs in a diversity of habitats and that there are no key plant or other specific indicators of habitat, other than open sandy areas within or adjacent to scrub or sandhill. Amount of open area was usually the primary indicator of suitable habitat (Knisley 2005, p. 5). Adults were most common along the middle and immediate edges of trails and paths; larvae were more common on the trail edges, closer to vegetation (Knisley 2005, p. 7). This suggests that adults use the open trails for thermoregulation and foraging, but move away from these areas to oviposit in more shaded microhabitats (Knisley 2005, p. 7).

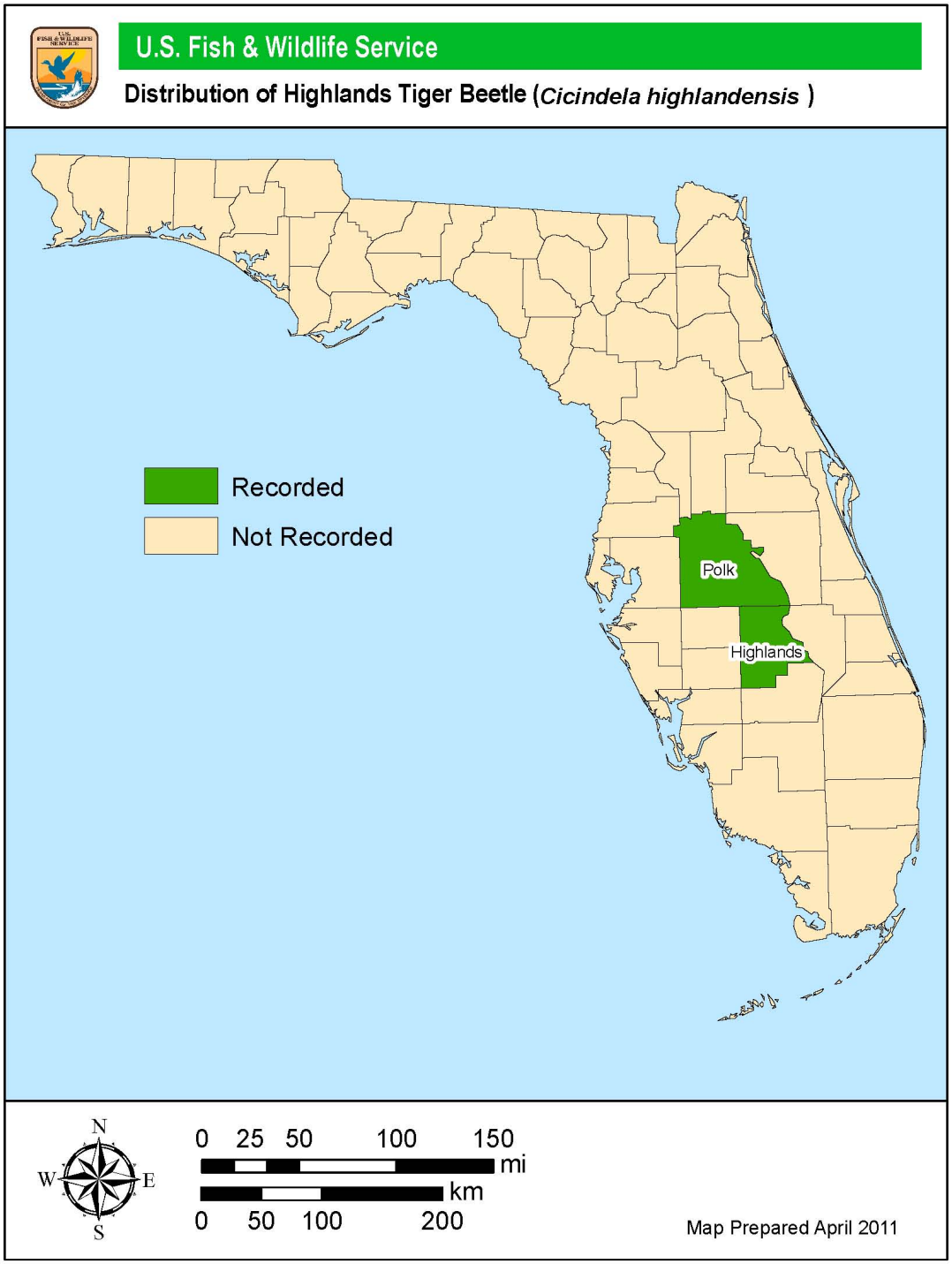
Among the sites with the largest numbers of beetles were typical Lake Wales Ridge scrub with naturally open interior areas (Catfish Creek, Flaming Arrow Scout Camp), scrub sites with open sandy roads or edges caused by human disturbance (Walk-in-Water, Carter Creek sites, Flamingo Villas), and pine flatwoods and longleaf pine sites with natural or disturbed areas (Snell Creek, Catfish Creek) (Knisley 2005, p. 7). At Catfish Creek which has the largest population, adults were widespread and occasionally abundant in trails and open areas of scrub, in sandhill habitat, and on trails adjacent to wet prairie and depression marshes (Knisley 2005, pp. 7-8).

Most known populations occur on scrub or sandhill, with probably more than 90 percent of observations in scrub (D. Almquist, pers. comm. 2008a; B. Knisley, Randolph-Macon College, pers. comm. 2008a). This species appears to require scrub or Lake Wales Ridge sandhill that is functionally equivalent to scrub (D. Almquist, pers. comm. 2008b). Although the Highlands tiger beetle may be found in flatwoods and other habitats in the vicinity of scrub, the species would not be found in the middle of an expanse of flatwoods or other habitat without scrub in the vicinity (D. Almquist, pers. comm. 2008b).

Roughly 85 percent of the scrub and sandhills on Lake Wales Ridge has been lost to development and agriculture (Friedman et al. 1993 as cited in Turner et al. 2006, p. 3). This loss of habitat has resulted in a concomitant reduction in the frequency and extent of wildfires (Turner et al. 2006, p. 3). While public and private entities have protected 87 km2 of scrub and sandhill habitat over the past two decades, protected fragments are surrounded by residential neighborhoods, citrus groves, and other anthropogenic habitats, and are managed by a variety of entities (Turner et al. 2006, p. 24); management in general is confounded by habitat fragmentation and land ownership. Analyses by Turner et al. (2006, p. i) indicate that while conservation efforts to date have contributed greatly to protecting imperiled species on the Lake Wales Ridge, many species are likely to remain at great risk of extinction despite ongoing conservation efforts, primarily because even under the most optimistic acquisition scenarios, little more than 7 percent of the original habitats will be protected since most have already been destroyed. Habitat conditions for the tiger beetle will likely remain suitable only with active management. Fragmentation of habitat and in-holdings within protected sites may limit application of fire and other management.

Historical Range/Distribution:

Because the Highlands tiger beetle has only been known since it was described in 1984, there are no records of its past distribution and abundance. It seems likely that it was common, widespread, and well established throughout the scrub and possibly high pine communities of the Lake Wales Ridge in Highlands and Polk Counties prior to the widespread destruction of these habitats over the past 50 years (Knisley and Hill 1992a, pp. 8-9).



Current Range Distribution:

Knisley and Hill (1996, p. 15) found the Highlands tiger beetle at 40 sites, 25 in Polk County and 15 in

Highlands County, an increase from the 23 sites reported by Knisley and Hill (1992a, p. 6), but not representing a substantial increase in geographic range. The 40 sites are all on the Lake Wales Ridge, the hilly upland along U.S. Highway 27 that is known for scrub vegetation and endemic plants and lizards. Knisley (2005, p. 8) indicated that the range of the Highlands tiger beetle is restricted to the core of the Lake Wales Ridge and nearly separate from that of the Florida scrub tiger beetle.

The northern limit of the Highlands tiger beetle is near Snell Creek north of Lake Marion, about 4 miles (6.4 kilometers [km]) east of Haines City (Knisley and Hill 1996, p. 40). This is near a unit of the Lake Wales Ridge NWR. The beetle has been found southeast of Lake Marion, in the vicinity of the Poinciana development and in the Allen David Broussard Catfish Creek Preserve east of Lake Pierce and northeast of Lake Wales. The range continues south through TNC's Tiger Creek Preserve, the Lake Wales Ridge State Forest's Walk-in-Water tract, Lake Weohyakapka and the west side of Lake Arbuckle (Lake Wales Ridge State Forest), and Carter Creek (Lake Wales Ridge Wildlife and Environmental Area), to the vicinity of Josephine Creek (Jack Creek tracts managed by the Southwest Florida Water Management District and the adjoining Henscratch tract of the Lake Wales Ridge Wildlife and Environmental Area).

Table 1. Sites with survey counts of > 40 adults (Knisley 2005, p. 19).

Site Name	Owner	Survey Count	
		2004-05 Total	2005 Total*
Horse Creek Scrub	partially acquired, SFWMD	47	47
Snell Creek South	Service	193	130
Snell Creek North	Service	44	40
Allen David Broussard Catfish Creek State Park Preserve	FDEP	493	43
Flaming Arrow Boy Scout Ranch	Private	175	-
Walk-in-the-Water Tract -Mary Moser	FDOF	45	-
Tiger Creek Preserve	TNC	70	27
Carter Creek A	Service	57	38
Flamingo Villas	Service	53	-

Overall, the total range measures a little over 90 km (56 miles) in linear distance (D. Almquist, pers. comm. 2008a). The maximum width of the range, east to west, is about 10 km (6 miles), but the minimum is zero in many areas (D. Almquist, pers. comm. 2008a). In short, the species' range is restricted and comprised of patches of suitable habitat that are disjunct and isolated. The species occupies only a portion of suitable habitat; the total known occupied area within this range is roughly 100 km2 (39 square miles) or less (D. Almquist, pers. comm. 2008a).

This species' narrow distribution may be in part due to its lack of dispersal. "Among tiger beetles there is a general trend of decreasing flight distance with decreasing body size (Pearson pers. comm.). Cicindela highlandensis is one of the smallest tiger beetles and an extremely weak flier (usually flying only 5-10 m) . . . Species in woodland, scrub or dune habitats seem to disperse less than water edge species, and this could further explain the apparent limited dispersal of C. highlandensis." (Knisley and Hill 1996, p. 13). The thermal requirements of the Highlands tiger beetle may also limit its dispersal as adults may overheat in full sun. They prefer partially shaded habitats. Larval burrows tend to be near vegetation, where they are shaded for part of the day.

Knisley (2005, p. 8) found the range of the Highlands tiger beetle restricted to the core of the Lake Wales Ridge and nearly separate from that the Florida scrub tiger beetle, which borders the range of the former species on all sides and extends well beyond the Lake Wales Ridge. At several locations (a few Lake Arbuckle sites and Henscratch), these two species were found to overlap or be contiguous (Knisley 2005, p. 8). Results of these surveys further suggest the distribution pattern of these two species may be determined by scrub height and elevation preferences. The Florida scrub tiger beetle occurs in scrub that is low in plant height and at lower elevations, and the Highlands tiger beetle prefers higher scrub where more shade is available and at higher elevations (Knisley 2005, p. 8).

Population Estimates/Status:

Knisley and Hill (1996, p. 7) used a mark-recapture method to estimate population sizes and found the largest populations at Catfish Creek, where four nearby sites yielded an estimated total of 841 adults. Most of the sites had only very small to medium sized populations, evidently because the sites have very little suitable habitat due to too-thick or low quality vegetation. Fortunately, small populations may be viable through time. Knisley and Hill (1996, pp. 20-21) monitored the northeastern beach tiger beetle (Cicindela dorsalis dorsalis), a federally listed threatened species, for 9 years. Their data suggest that to be viable in the face of randomly-occurring events, populations must have at least 500 to 600 adults (Knisley and Hill 1996, pp. 20-21). Sand dune and scrub species typically exist at lower densities and can probably maintain themselves at smaller population sizes (Knisley and Hill 1996, p. 21). One Arizona grassland species seemed to maintain abundance over an 8-year period at adult numbers ranging from 50 to 120 (Knisley and Hill 1996, p. 21). In the absence of population viability studies, a population of about 100 adult Highlands tiger beetles in an area of at least 1 to 2 ha (roughly 2 to 4 acres) might be sufficient for long-term viability (Knisley and Hill 1996, p. 21). Knisley and Hill (1996, p. 21) indicated that many of the smaller occurrences of Highlands tiger beetles persisted over a 5-year period.

Knisley (2005, p. 2) surveyed all known and additional sites (72) throughout the range of the Highlands tiger beetle in Polk (45 sites) and Highlands (27 sites) Counties in 2004 and 2005 to determine abundance, distribution, and conservation status. Population sizes were primarily estimated by visual index counts, but mark-recapture (Lincoln Index) and removal methods were also used to supplement and interpret visual index counts (B. Knisley, pers. comm. 2008a). A total of 1,574 adults was found at 40 sites compared with 643 adults at 31 sites in 1996, 928 adults at 31 sites in 1995, and 742 adults at 21 sites in 1993 (Knisley 2005, pp. 2, 5-6). Of the 40 sites in the 2004-2005 surveys with one or more adults: 3 sites were found to have large populations of over 100 adults [Catfish Creek Preserve (493), Snell Creek South (193), Flaming Arrow Scout Camp (175)]; 3 sites had populations of 50-99 adults; 8 sites had 20-49 adults, 13 sites had 10-19 adults, and 13 sites had fewer than 10 adults (Knisley 2005, pp. 2, 6). Results from a limited removal study at four sites and similar studies indicated that the actual population size at medium to large sites can be as much as two times as high as indicated by the visual index counts, whereas small to medium sites can be up to 50 percent larger in size (Knisley 2005, pp. 2, 7). If these assumptions are accurate and unsurveyed habitat is included, then the total number of adults at all study sites might be 3,000 to 4,000 (Knisley 2005, p. 7).

Overall, Knisley (2005, pp. 2, 8) found evidence for a significantly improved conservation status of the Highlands tiger beetle in the 2004-2005 survey compared to the 1996 survey. He attributed the improvement to the conservation of several new and good quality sites, which support medium or large populations of the tiger beetle, and the improvement of habitat quality due to management activity at several other sites. Actual short- and long-term effects of prescribed burns and other management actions, however, are not known (B. Knisley, pers. comm. 2008b). In the 2004-2005 study, a subjective grade of A to D was assigned to each site based on habitat size, quality, population size, protection status, and impacts, with “A” representing the best sites (Knisley 2005, p. 5). Of the forty sites, five were given A grades) and seven were given B grades compared to three sites with A grades and five sites with B in 1996 (Knisley 2005, p. 8). Some of these sites have been protected in the decade between studies through acquisition (Knisley 2005, p. 2). In addition, there has been a loss of only a few small or lower quality sites (e.g., due to development), and only a few sites

decreased in habitat quality or had fewer reported beetle numbers over the same period (Knisley 2005, pp. 8, 20). Additional improvement in the status of the beetle could be made with even limited habitat management at most sites, which could increase habitat quality and beetle numbers (Knisley 2005, p. 8).

Long-range dispersal potential of the species is not known, but is an important factor in delineating populations and assessing viability (D. Almquist, pers. comm. 2007a, 2008b; B. Knisley, pers. comm. 2008a, 2008c). While some tiger beetles are strong fliers and can make vertical flights above vegetation to disperse, the Highlands tiger beetle likely has limited dispersal ability (B. Knisley, pers. comm. 2008a, 2008c). There are significant barriers of non-habitat (e.g., developments, agriculture) or unsuitable habitat (e.g., overgrown scrub) between many of the sites (B. Knisley, pers. comm. 2008a). NatureServe (2010, p. 4) currently uses 4 km (2.5 miles) as the separation distance cutoff between occurrences if unsuitable habitat is present, and 10 km (6.2 miles) if suitable habitat is present; these figures are somewhat arbitrary, but reasonable considering the dispersal capabilities of related species (D. Almquist, pers. comm. 2007a, 2008c; B. Knisley, pers. comm. 2008c). Thus, the 40 sites would equate to approximately 5 occurrences using NatureServe standards for separation distance, but could be up to 10 populations, depending upon actual long-term separation distances (D. Almquist, pers. comm. 2008c). NatureServe (2010, p. 1) estimates that there are 5 to 10 populations remaining.

The FNAI (2011, p. 16) indicates that the species has a global status of G1G2, giving it a range of ranks due to insufficient data to assign a specific global rank. This ranking ranges from G1 [“critically imperiled globally because of extreme rarity (5 or fewer occurrences or less than 1000 individuals) or because of extreme vulnerability to extinction due to some natural or man-made factor”] to G2 [“imperiled globally because of rarity (6 to 20 occurrences or less than 3000 individuals) or because of vulnerability to extinction due to some natural or man-made factor”]. NatureServe (2010, p. 1) indicates the Highlands tiger beetle has a rounded global status of G1, critically imperiled due to its small range, limited habitat, small number of populations (5 to 10), and severe threats of habitat loss and degradation. Several sites are small in size (less than 1 ha [2.47 acres]), contain only a small amount of suitable open habitat, and are isolated from other suitable habitat (Knisley and Hill 1996, p. 11; NatureServe 2009, pp. 2, 4). The Highlands tiger beetle is recognized in Florida’s Comprehensive Wildlife Conservation Strategy as one of Florida’s species of greatest conservation need; status was considered as low (measure of species abundance), trend was considered declining (FWC 2005, p. 90). The Highlands tiger beetle is not listed as endangered or threatened in Florida, and there is no wildlife management plan for this species.

Threats

A. The present or threatened destruction, modification, or curtailment of its habitat or range:

The Highlands tiger beetle depends on open, sandy areas within the Lake Wales Ridge upland vegetation. This vegetation has largely been converted to citrus groves and residential areas. Roughly 85 percent of the scrub and sandhills on Lake Wales Ridge has been lost to development and agriculture (Friedman et al. 1993 as cited in Turner et al. 2006, p. 3). This loss of habitat has resulted in a concomitant reduction in the frequency and extent of wildfires (Turner et al. 2006, p. 3). Substantial habitat loss and degradation has contributed to the decline of the species. NatureServe (2010, p. 2) describes the global long-term trend as “very large to large decline” (decline of 75 percent to > 90 percent). Further habitat loss is a widespread threat as development and citriculture continue (NatureServe 2010, p. 2). For example, a comparison of aerial photographs of the general area of the type locality from 1970 and 2004 show that most of the suitable habitat has been developed, cleared completely, or overgrown due to fire suppression (D. Almquist, pers. comm. 2008d). Another site (i.e., near Poinciana B) is being impacted by a new development; this development will likely cause extirpation of the beetle from the entire area (D. Almquist, pers. comm. 2008e). Knisley (pers. comm. 2009) suggested that even if the species has high dispersal capabilities, there is too great a distance

and significant barriers of non-habitat (e.g., developments, agriculture) or unsuitable habitat (e.g., overgrown scrub) between some sites to allow exchange of adults. Habitat fragmentation is a serious concern (B. Knisley, pers. comm. 2009).

The threat of habitat loss, degradation, and fragmentation is expected to continue and increase. Analyses by Zwick and Carr (2006, p. 11) indicated that the central Florida region is expected to experience "explosive" human population growth, with continuous urban development from Ocala to Sebring; virtually all of the natural systems and wildlife corridors in this region will be fragmented, if not replaced, by urban development. Highlands County, with a population of 87,366 in 2000 is projected to increase to 170,038 by 2060 (Zwick and Carr 2006, p. 20). Polk County, with a population of 483,924 in 2000, is projected to increase to 1,029,606 by 2060 (Zwick and Carr 2006, p. 21). Fortunately, much of the known high quality habitat for Highlands tiger beetle has been acquired and placed in public or other conservation ownership. Although most occupied sites are protected, the fragmented nature of these protected sites along with the influx of development around them may preclude the ability to conduct prescribed burns or other management actions essential to preserving the species. In addition, increased threats from recreational impacts on protected sites are also expected to increase with increased human population (see Factor E).

The threat of habitat loss also occurs from increasing vegetation density from ecological succession and fire suppression (NatureServe 2010, p. 2). Habitat degradation and modification due to ecological succession, fire suppression, and lack of management are major threats to this species (D. Almquist, pers. comm. 2008d). Lack of management of the remaining scrub and high pineland vegetation may constitute a threat as serious as habitat loss (Knisley and Hill 1992a, p. 9; 1992b, pp. 133-140; 1996, pp. 20-22). The vegetation in which the beetle occurs is subject to fire, ranging from relatively frequent and low-intensity in high pineland to infrequent and high intensity in some scrub (Myers 1990, pp. 151-154). Years of fire suppression in most upland habitats of the Lake Wales Ridge led to the vegetation becoming much thicker, with few patches of bare ground. One indicator of ecological problems caused by fire suppression is that small scrub plants (herbs and smaller shrubs) are now typically most abundant in artificially disturbed areas such as firebreaks.

Management of scrub habitat along the Lake Wales Ridge is improving. Over the past 10 years, the Lake Wales Ridge Prescribed Fire Team has conducted 603 burns helping to restore more than 28,340 ha (70,000 acres) on 25 conservation sites along the Lake Wales Ridge (TNC 2010, p 2). However, a backlog of long-unburned habitat within conservation areas remains. For example, 16 of the 63 Lake Wales Ridge conservation sites have not received any fire management since they were acquired (TNC 2010, p. 4). Based upon TNC's fire history database from 2008 (the last year for which data analysis was completed), 49,994 ha (123,484 acres) are within fire maintenance condition and 15,530 ha (38,359 acres) are outside the recommended fire return interval (TNC 2010, p. 5).

Implementing burning schedules should create more open habitat and benefit the species (Knisley 2005, pp. 8-9). However, it is uncertain if the method or time of burning has had negative effects on the beetle. Knisley (2005, p. 9) suggested that burning conducted during the period of adult activity, mid-May through July, in areas with adults would likely cause some mortality to adults that cannot escape (by flying) from fire. In addition, fire and post-fire effects might also make the habitat unsuitable for larval recruitment because of adult mortality and, perhaps more importantly, the disturbance to oviposition from burning activities (Knisley 2005, p. 9). Knisley (2005, p. 9) suggested that larvae, which live in burrows, may not be affected by burning. The negative impacts from burning would probably be countered by improved habitat conditions within 1 to 2 years and an increase in the populations (Knisley 2005, p. 9).

Natural and artificial disturbances can improve habitat conditions for the Highlands tiger beetle. Knisley and Hill (1992a, p. 9) noted that "our surveys for this species revealed that most sites we checked were very densely vegetated, a feature which we believe contributes to the low numbers of C. highlandensis we typically found. We have recently documented how this type of habitat change from ecological succession can cause the decline and local extirpation of tiger beetle species (Knisley and Hill 1992[b]). One example we present is the extirpation of C. abdominalis (the species to which highlandensis is most closely related) at

a Virginia pine barrens site in the 1930's from encroaching vegetation from succession and fire suppression." Knisley (2005, p. 9) suggested that scraping or cutting of trails or open areas will cause some mortality to adults and especially larvae, but that the population would probably recover and increase in numbers within a few years of this disturbance.

While trails for fire management or recreational purposes (all-terrain vehicles or four-wheeling) may provide needed open habitat for the Highlands tiger beetle (Knisley and Hill 1992a, p. 7), vehicular activity has harmed beach-dwelling tiger beetles in the northeastern U.S. Larvae live in burrows near the ground surface and may be killed by off-road vehicle traffic (NatureServe 2010, p. 2) (see Factor E). However, factors that create patches of bare sand could be beneficial, if potentially lethal disturbances do not occur often (NatureServe 2010, p. 2).

Invasion by non-native plant species is a lesser threat, but one that appears to be increasing. Many conservation land managers work to control the spread and prevent additional invasions of exotics on a continual basis.

In summary, land acquisition by the State of Florida, the Service, TNC, and others has placed most of the remaining good-quality Highlands tiger beetle habitat in public or other conservation ownership. Habitat loss, while serious, has been partially addressed, especially by the State in cooperation with local governments. State land managers are implementing prescribed fire programs, exotic plant control, and visitor management, which should benefit this species. Significant progress has been made by the State and other entities toward reducing these threats through acquisition and management at some sites. However, habitat loss, conversion, degradation, and fragmentation are expected to continue and increase, affecting any populations on private lands as well as those on protected lands that depend on management actions (i.e., prescribed fire) where these actions could be precluded by surrounding development.

B. Overutilization for commercial, recreational, scientific, or educational purposes:

Members of the genus Cicindela may be the subject of more intense collecting and study than any other single beetle group (Knisley and Hill (1992a, p. 9). Knisley and Hill (1992a, p. 9) stated that overcollecting of the Highlands tiger beetle may be of "some importance" and suggested that overcollecting may have been partly responsible for the extirpation of the species from the site where Choate had first collected it (i.e., the type locality). Knisley and Hill (1992a, p. 10) estimated that 500-1,000 adults had been collected at this site during a several year period after its initial discovery. More recently, Almquist (pers. comm. 2007b, 2008a) stated that the Highlands tiger beetle has not been extirpated from its type locality. The discrepancy may be because the type series was taken from the east side of the road by Choate; this site was subsequently converted to citrus and no beetles were found in the surrounding marginal habitat (B. Knisley, pers. comm. 2008a). The beetle can still be found on the west side of the road; since close habitat patches can be interpreted as being part of the same site, the west side of the road could be considered as part of the type locality (B. Knisley, pers. comm. 2008a).

Many tiger beetle enthusiasts in general have little regard for conservation; some have little regard for rarity and collect early in the season before oviposition, which can negatively affect populations (B. Knisley, pers. comm. 2008a). For the Highlands tiger beetle, however, Knisley (pers. comm. 2008a) does not believe that collecting has caused a significant reduction in populations; most collectors take from sites with larger numbers, and thus are unlikely to cause a major impact. Knisley and Hill (1992a, p. 9) indicated that they know personally or indirectly at least 30 individuals who regularly or actively collect tiger beetles (in general). More recently, Knisley (pers. comm. 2008a) stated that he is aware of 5-10 collectors who have collected several hundred or more of this species in the past 5-8 years. Overall, collection is a threat, especially if taken before oviposition or from small sites. However, for most sites, impacts from collecting may not be as severe as habitat loss, degradation, and modification (see Factor A) (B. Knisley, pers. comm. 2008a).

NatureServe (2010, p. 2) indicates that scientific collecting for survey purposes might be a concern in small and isolated patches of habitat if this species were purposely targeted. However, NatureSeve (2009, p. 2) suggests that general collecting techniques (e.g., pitfall traps, Malaise traps, light traps) should not be considered threats. Almquist (pers. comm. 2008a) indicated that there is no evidence that collecting has negatively impacted any populations of this species, but suggested that it is possible that collecting could be a factor in small, isolated, and poor-quality patches of habitat. Almquist (pers. comm. 2009) also suggested that the species may be somewhat resilient to collection. Since occurrences are not being regularly monitored and collecting activities would likely be unannounced, it is not possible to assess the actual impacts of collection on any population.

In summary, collection is documented and currently occurring. Due to the species' vulnerability, collection is considered a threat, especially if adults are taken prior to oviposition or from small, isolated, or poor-quality sites. It is not possible to assess actual impacts to the population since most occurrences of Highlands tiger beetle are not regularly monitored. Most collectors appear to be collecting beetles from larger sites. Overall, we believe the current threat level is moderate at this time.

C. Disease or predation:

There is apparently no literature on diseases or their impact on tiger beetles, so the effect of this threat on the Highlands tiger beetle is unknown (B. Knisley, pers. comm. 2011). It is likely that the beetle experiences the limiting effects from natural enemies and generally low survivorship that are seen for other tiger beetle species (Knisley and Hill 1996, pp. 5, 20). In general, parasites are considered to have greater effects on tiger beetles than predators (Nagano 1982, p. 34; Pearson 1988, pp. 136-138). While predators and parasites play important roles in the natural dynamics of tiger beetle populations, the small sizes of Highlands tiger beetle populations may render them vulnerable to predation and parasitism that would otherwise constitute a normal part of their environment.

The main natural enemies of adult tiger beetles are robber flies (Family Asilidae) and birds. Parasitoid wasps (Family Tiphiidae, genus Methocha) and bombyliid flies (genus Anthrax) are the main predators of larvae (Knisley and Hill 1989, pp. 18-20; Hill and Knisley 1991, pp. 42-43). Bombylid flies (Anthrax) were the main parasite found affecting Highland tiger beetle larvae, accounting for over 13 percent mortality at one site (B. Knisley, pers. comm. 2011). The parasitic wasp Methocha is the primary parasite of tiger beetle larvae and was also observed at one site, but its potential impact on the species is unknown (B. Knisley, pers. comm. 2011). Ants may sometimes affect larvae, especially during first instar (a stage in the life of an arthropod between two successive molts) (Knisley 1987, p. 1196). Most tiger beetles species that have been intensely studied experienced relatively high levels of larval parasitism (10 to over 40 percent) (Knisley and Hill 1992a, p. 10). At this time, the overall threat of predation and parasitism is not known.

D. The inadequacy of existing regulatory mechanisms:

There are no regulatory mechanisms currently in place to protect the Highlands tiger beetle and its habitat. The FWC has not listed this insect as threatened or endangered, nor are there other State or local regulatory mechanisms in place. Because the beetle is not listed at the State or Federal levels, nothing prohibits importing, exporting, sale, or trade of the species.

E. Other natural or manmade factors affecting its continued existence:

The Highlands tiger beetle is vulnerable to a wide array of natural and human factors. Populations are small and isolated and appear to occupy relatively small patches of habitat. Of the 40 sites supporting the species (Knisley 2005, pp. 2, 5-6), at least 9 are less than 1 ha in size (NatureServe 2009, p. 1). Viability at small and

isolated sites is uncertain. Because increased extinction rates are directly correlated with reduction of available habitat area and increased distances between small populations (Gilpin 1987, pp. 135-138), the small, isolated populations may be vulnerable to local extinction from normal fluctuations in population size, genetic problems from small population size, or environmental catastrophes. In the absence of population viability studies, populations of about 100 adult Highlands tiger beetles in an area of at least 1 to 2 ha (roughly 2 to 5 acres) may be sufficient for long-term viability (Knisley and Hill 1996, p. 21). However, population sizes have not been studied in detail and metapopulation viability studies have not been conducted. The small sizes of occupied habitat also reduce the ability of the habitats to buffer against edge effects and other influences from adjacent developed areas, such as pesticide drift (see discussion of pesticides below).

The difficulty of dispersal between suitable patches of habitat may also result in local extirpations. Knisley and Hill (1992a, p. 11) noted that "tiger beetles, like many other insects, experience extreme year-to-year fluctuations in abundance such that small or moderate populations may be subject to natural extinctions. Our studies with C. dorsalis (and C. puritana), two Federally Listed species, indicate that 2-3 fold differences in abundance are common and that local extinctions and colonization of new sites occur. The presence of numerous populations within an area is important for the survival of this species by providing for repeated immigration, dispersal, and colonization sites critical for the population dynamics of this species (Hill and Knisley 1992). The extirpation of both of these species from most of their ranges in the Northeast seems to have been the result of gradual reductions and fragmentation of habitats which eventually prevented successful recolonization and supplementation of the few surviving populations. Populations of C. highlandensis already appear to be highly fragmented in scattered areas of small habitat patches . . . and subject to genetic decline and other related problems for small, isolated populations." The Highlands tiger beetle is one of the smallest tiger beetles and appears to be a weak flier, meaning it probably only disperses over short distances. Long-range dispersal potential of the species is not known, but such information is important to delineate populations and assess viability (D. Almquist, pers. comm. 2007a, 2008b; B. Knisley, pers. comm. 2008a, 2008c; NatureServe 2010, p. 4).

No assessment has been made of possible threats to Highlands tiger beetle from maintenance of fire lanes, recreational use of off-road vehicles, and pedestrian traffic. Vehicle and pedestrian traffic is a problem for tiger beetles on Florida beaches (Choate 1996, pp. 1-3). Populations of a tiger beetle species in the northeastern United States, Cicindela dorsalis dorsalis, were extirpated in several localities that were subjected to heavy recreational use (i.e., heavy pedestrian foot traffic and vehicular use), but survived at sites that received little or no recreational disturbance (Knisley and Hill 1992b, p. 138). Nagano (1982, p. 35) stated that off-road vehicles are a significant threat to tiger beetles in general; larval burrows are easily collapsed and larvae crushed. Since larvae of the Highlands tiger beetle live in burrows near the ground surface, this species may be easily killed or harmed by local off-road vehicle traffic (NatureServe 2010, p. 2). With increased human population, occupied habitat may be placed at greater risk of degradation due to increased demand for recreational uses, especially on public lands.

Pesticides may be a potential threat to the Highlands tiger beetle. The negative effects of insecticides on other tiger beetle species are summarized by Nagano (1982, p. 35). Previously, mosquito spraying had been considered a serious threat at some or most sites (NatureServe 2010, p. 5). However, pesticides used for mosquito control may not be of great concern for the Highlands tiger beetle, compared to other tiger beetles, because this species is restricted to xeric habitats where aerial adulticide applications may be minimal (D. Almquist, pers. comm. 2008a; R. Frakes, Service, pers. comm. 2009). Drift from pesticides applied to nearby citrus or other agriculture are more likely a concern (D. Almquist, pers. comm. 2008a, 2008d; B. Knisley, pers. comm. 2008a). NatureServe (2010, p. 5) suggests that seemingly suitable habitat may in some way be unsuitable based upon soil or microclimate differences or possibly factors such as mosquito control. As urban development and agriculture increase near or in Highlands tiger beetle habitat, negative impacts from pesticides may become a greater threat.

Highlands tiger beetle populations are on a variety of sites, ranging from large, contiguous tracts of

conservation lands to conservation lands with numerous in-holdings, to privately owned sites. Illicit waste dumping is a documented problem at several sites, including the Flamingo Villas tract of the Lake Wales Ridge NWR, where boundary fencing has been installed to discourage unauthorized access.

In summary, the beetle is vulnerable to a wide array of natural and human factors, including: low population sizes, restricted range, small and isolated habitat patches, and difficulty in dispersing between suitable habitats. Potential human threats include: off-road vehicle and pedestrian traffic, fire break maintenance, pesticide use, and illicit waste dumping.

Conservation Measures Planned or Implemented :

The State of Florida has acquired a number of sites occupied by the Highlands tiger beetle, including those listed above. The Service is continuing with acquisition of conservation lands on a lot-by-lot basis at Carter Creek and Flamingo Villas of the Lake Wales Ridge NWR. This area has been fenced to provide protection from unauthorized access. Other areas are targeted for acquisition: 7.76 km2 in Carter Creek A, part of Lake Wales Ridge NWR; 0.52 km2 in Flamingo Villas, part of Lake Wales Ridge NWR; 2.79 km2 in Horse Creek Scrub; roughly 13.40 km2 in The Walk-in-the-Water Tract, owned and managed by the Florida Division of Forestry. Efforts by the Service, the State, and other entities have the potential to secure additional habitat for the beetle. Continued acquisition and land management remain the greatest need for accomplishing the long-term protection and recovery of this species on the Lake Wales Ridge.

Land managers in the Lake Wales Ridge area have begun to conduct more prescribed burning to enhance or restore scrub habitat. The Lake Wales Ridge Prescribed Fire Team is active and working with a multitude of partners (TNC 2010, pp. 1-8). In addition, TNC has developed a spatial database for tracking fire history; this gives a comprehensive view of managed areas and a landscape-level picture of fire history and natural communities to help assess the overall health of protected areas on the Lake Wales Ridge (TNC 2010, p. 5). The fire database provides a method of documenting, through time, how well the fire-maintained natural communities are being managed with fire (TNC 2010, p. 5). In addition, TNC has developed a GIS tool to map critical smoke buffers for all conservation lands on the Lake Wales Ridge; this should help minimize potential conflicts between conservation and urban or suburban land uses (TNC 2010, p. 5). Prescribed burning on private and public conservation lands has likely improved habitat for this species and may provide improved habitat conditions in the future.

Summary of Threats :

Habitat loss, degradation, and fragmentation have destroyed a substantial portion of the Highlands tiger beetle’s historical range; these threats are continuing and are expected to increase. Although most of the largest populations occur on conservation lands, the specific habitat requirements of the beetle make its continued persistence uncertain. Increasing vegetation density from ecological succession and fire suppression is a threat. However, collaborative efforts are underway to effectively implement prescribed fire on conservation lands on the Lake Wales Ridge. Still, a backlog of long-unburned habitat within conservation areas remains. The species is inherently vulnerable to extinction due to its low population sizes, restricted range, small and isolated habitat patches, and difficulty in dispersing between suitable habitats. Potential threats include off-road vehicle and pedestrian traffic, fire break maintenance, pesticide use, and illicit waste dumping at some sites. In addition, collection of the Highlands tiger beetle is documented and currently occurring. Due to the species’ vulnerability, collection is considered a threat, especially if adults are taken prior to oviposition or from small, isolated, or poor-quality sites. We find that this species is warranted for listing throughout all its range, and, therefore, find that it is unnecessary to analyze whether it is threatened or endangered in a significant portion of its range.

For species that are being removed from candidate status:

_____ Is the removal based in whole or in part on one or more individual conservation efforts that you determined met the standards in the Policy for Evaluation of Conservation Efforts When Making Listing Decisions(PECE)?

Recommended Conservation Measures :

• Continue acquisition and protection of habitat by private, county, State, and Federal entities (Knisley 2005, p. 8).
• Continue monitoring and surveying known sites, especially unsurveyed nearby areas with suitable habitat, and search for new sites (D. Almquist, pers. comm. 2008a; B. Knisley, pers. comm. 2008a, 2008b).
• Implement burning schedules as part of land management practices on conservation lands to create and maintain more open habitat. However, the method and timing of burns may have negative effects. For example, burns conducted during the period of adult activity (mid-May through July) in areas with adults may cause some mortality (Knisley 2005, pp. 8-9).
• Cut or scrape new trails and / or open areas throughout sites to create more open habitat (Knisley 2005, p. 9), especially on lands on which it is difficult to burn appropriately.
• Conduct studies of the effects of burning and other management approaches through experimental comparative studies (preferred) or annual monitoring over a number of years at sites with and without management (B. Knisley, pers. comm. 2008b).
• Limit pesticide use in and around Highlands tiger beetle habitat. Assess the potential threat of pesticides from adjacent citrus groves (NatureServe 2010, p. 4).
• Limit off-road vehicle use in and around Highlands tiger beetle habitat to protect larvae.
• Minimize trash dumping in Highlands tiger beetle habitat through regulations, increased fines, and posting of signs marking boundaries of conservation lands.
• Determine long-range dispersal potential to help delineate populations and assess viability (D. Almquist, pers. comm. 2007a).
• Conduct annual monitoring over a number of years to obtain information on population size and fluctuations such that a population viability model can be developed (B. Knisley, pers. comm. 2008b).
• Conduct studies to refine microhabitat requirements, life history, and other parameters necessary for appropriate conservation and management (NatureServe 2010, p. 4). Information on dispersal and recruitment is needed, especially in smaller sites; this is key to defining viable populations and prioritizing lands for potential acquisition or protection (NatureServe 2010, p. 4).
• Examine the effects of off-road vehicles and other human disturbances (some possibly beneficial) (NatureServe 2010, p. 4).
• Consider studies to determine current level of genetic variation remaining.

Priority Table

Magnitude	Immediacy	Taxonomy	Priority
High	Imminent	Monotypic genus	1
		Species	2
		Subspecies/Population	3
	Non-imminent	Monotypic genus	4
		Species	**5**
		Subspecies/Population	6
Moderate to Low	Imminent	Monotype genus	7
		Species	8
		Subspecies/Population	9
	Non-Imminent	Monotype genus	10
		Species	11
		Subspecies/Population	12

Rationale for Change in Listing Priority Number:

Magnitude:

The Highlands tiger beetle is narrowly distributed and threatened by habitat loss, degradation, and fragmentation from residential development and the citrus industry. The central Florida region where this species occurs is expected to undergo explosive human population growth in the next few decades, further contributing to this threat. Ecological succession, fire suppression, and lack of management also threaten persistence at many sites. The fragmented nature of protected sites along with the influx of development around them may preclude the ability to conduct prescribed burns or other beneficial management actions. Populations are small and isolated and appear to occupy relatively small patches of habitat. Difficulty in dispersing between suitable patches of habitat may result in local extirpations. Due to the species' vulnerability, collection is considered a threat, especially if adults are taken prior to oviposition or from small, isolated, or poor-quality sites. Loss of larvae and destruction of burrows by off-road vehicles on public and private sites is a concern. Other potential threats include fire break maintenance, pedestrian traffic, pesticide use, and illicit waste dumping at some sites. Overall, we find the magnitude of threats to be high.

Imminence :

Although habitat loss, degradation, and fragmentation are continuing, acquisition of suitable habitat for State conservation lands, the Lake Wales Ridge NWR, and other private preserves have helped reduce these threats. Habitat management at some sites may be forestalling the threat of vegetation encroaching into bare sand areas needed by the beetle. The species is inherently vulnerable to extinction due to its low population sizes, restricted range, small and isolated habitat patches, and difficulty in dispersal between suitable habitats. The immediacy of these threats is unknown. Collection is currently occurring, but it is not possible to assess actual impacts to the population since most occurrences are not regularly monitored. Potential threats include off-road vehicle and pedestrian traffic, fire break maintenance, pesticide use, and illicit waste dumping at some sites. Overall, sufficient conservation efforts are being made, and threats are considered to be non-imminent.

__Yes__ Have you promptly reviewed all of the information received regarding the species for the purpose of determination whether emergency listing is needed?

Emergency Listing Review

__No__ Is Emergency Listing Warranted?

A status survey completed in October 2005 suggested that the status of the Highlands tiger beetle has improved (Knisley 2005, p. 8). Efforts to implement prescribed fire on conservation lands are continuing (TNC 2010, pp. 1-8). This should help maintain or improve habitat conditions for this species.

Description of Monitoring:

The Service funded a rangewide survey for the Highlands tiger beetle by Dr. Barry Knisley in 2004. The survey was completed in October 2005 and provides the most recent information. Results of the 2004-2005 study suggested that the status of the beetle improved since the last survey in 1996 (Knisley 2005, p. 8). No additional monitoring has been conducted since that time.

The Service participates as a member of the Lake Wales Ridge Ecosystem Working Group, a cooperative group comprised of private, local, State, and Federal entities interested in identifying and addressing sources of concern and threats to the health of the Lake Wales Ridge Ecosystem. The Lake Wales Ridge Working Group and its subgroups (Listed Species, Fire, Exotics, and Education) focus on restoration and management of lands throughout the Lake Wales Ridge Ecosystem. Although this group includes managers of all conservation lands within the range of the Highlands tiger beetle, monitoring specifically for this species was not reported during the year by any members of this group.

Indicate which State(s) (within the range of the species) provided information or comments on the species or latest species assessment:

Florida

Indicate which State(s) did not provide any information or comment:

none

State Coordination:

The Service requested new information (observations, data, reports) regarding the status of this species and any new information regarding threats to this species from: Florida Department of Agriculture and Consumer Services, Florida Department of Environmental Protection, FWC, U.S. Geological Survey, U.S. Environmental Protection Agency, National Park Service, Service (Ecological Services and National Wildlife Refuges), FNAI, Archbold Biological Station, The Institute for Regional Conservation, University of Florida, Florida International University, Randolph-Macon College, mosquito control districts, and other entities. In total, the previous assessment was sent to approximately 116 individuals. Limited new information was received. All information and comments were incorporated into this assessment.

The Highlands tiger beetle is recognized in Florida's Wildlife Action Plan, Florida's Comprehensive Wildlife Conservation Strategy, as one of Florida's species of greatest conservation need (FWC 2005, p. 90).

No new data or comments were received from the State for this assessment. Information and data previously provided have been incorporated into this assessment.

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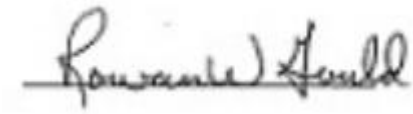
Approval/Concurrence:

Lead Regions must obtain written concurrence from all other Regions within the range of the species before recommending changes, including elevations or removals from candidate status and listing priority changes; the Regional Director must approve all such recommendations. The Director must concur on all resubmitted 12-month petition findings, additions or removal of species from candidate status, and listing priority changes.

Approve:  06/12/2012
Date

Concur:  11/06/2012
Date

Did not concur: _____ _____
Date

Director's Remarks: